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EXAMINER	
RUTHKOSKY, MARK	
ART UNIT	PAPER NUMBER
1745	

DATE MAILED: 12/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/845,985	CHALONER-GILL ET AL.
	Examiner	Art Unit
	Mark Ruthkosky	1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 26 September 2006.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4,6-10,12,14-21,48-50 and 52-61* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,6-10,12,14-21,48-50 and 52-61* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☒ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

This office action is in response to the amendment filed on 9/26/2006.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-4, 6-10, 12-21 and 48-61 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In the claims, the phrase, "less than about" is indefinite as the limitation, "less than" describes a definite maximum value, while the word "about" contradicts that value. Further, the phrase "greater than about" is indefinite as the limitation, "greater than", describes a definite minimum value while the word "about" contradicts that value. The same reasoning is applied to the phrase "at least about," for example in claim 53. As shown in the MPEP, section 2173.05(b), section (a), the phrase "at least about" is held as indefinite. The same reasoning is applied to the phrase, "less than about." As shown in the MPEP, section 2173.05(b), the phrase "at least about" is held as indefinite where there is close prior art and nothing in the specification, prosecution history or prior art to provide an indication of what range of specific activity is covered by the term "about," with the MPEP citing Amgen Inc. vs. Chugi Pharmaceutical Co. Ltd. It is noted that prior art has been applied with respect to the claimed particle size.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-4, 6-7, 10, 12, 14-17, 19-21, 48-50, 52-53 and 55-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamauchi et al. (US 5,538,814), in view of Manev (US 5,789,115.)

The instant claims are to a collection of particles comprising a crystalline composition with a phosphate anion and a lithium cation; the collection of particles has an average particles size of less than about 1000 nm and i) having essentially no particle with a diameter greater than about 5 times the average particle size (independent claims 1 and 21,) OR ii) having a distribution of particle sizes such that at least about 95 percent of the particles have a diameter greater than about 40 percent of the average diameter and less than about 160 percent of the average diameter (independent claims 55 and 58.)

Kamauchi et al. (US 5,538,814) teaches a lithium secondary battery with a lithium cobalt phosphate active material with an average particle size of 10 nm to 20 μm (see claims 1-14, claim 3.) Examples 10 and 12 and Table 7 teach active material sizes on the order of 500 and 10 nm. The reference teaches ball-milling the materials to give small particles sizes. Other metals may be added to the lithium cobalt phosphate active material (col. 4, lines 10-65.) Lithium, cobalt and nickel are included in the active material of example 4. The material may be

crystalline or amorphous (see col. 6, lines 1-20.) The material may be of the formula $LiCoPO_4$ with Fe substituted for the Co (see column 4, lines 15-55.) Various substituents may be substituted into the lithium transition metal oxide complex (col. 1, lines 55-67.) The lithium transition metal oxide active material is uniformly blended and formed into a positive electrode. With regard to the phrases "less than about," "greater than about," and "at least about" in the claims, the reference is considered to include points both within and "about" the end points of the range based on the teachings of 10 nm to 20 μm.

The reference does not teach that the collection of particles has essentially no particle with a diameter greater than about 3 times or 5 times the average particle size OR that at least 95 percent of the particles have a diameter greater than about 40 percent and less than about 160 percent of the average diameter.

Manev (US 5,789,115) teaches cathode materials for a lithium battery. Manev teaches that the mean particle size and the particle size distribution are two of the basic properties characterizing the positive electrode intercalation materials for lithium secondary batteries. The properties are important because they directly influence the charge-discharge rate capacity, the safety cell performance and other features of the battery. A decrease in the mean particle size and the distribution typically results in an increase in the cycleability of these electrode active materials (col. 1, lines 34-50.) Smaller particles are relatively more flexible and cycling does not damage the material to the degree of larger particles. Based on the teachings of Kamauchi and Manev, it would be obvious to one of ordinary skill in the art at the time the invention was made to prepare an electrode of a collection of particles for an electrode material of Kamauchi having a greater number of particles as close in size to the desired average diameter as possible, as the

average diameter has been shown to be critical to the invention (see Kamauchi col. 5, lines 25-end; Manev col. 1, lines 34-50.) Similarly, it would be obvious to have an electrode with at least 95 percent of the particles have a diameter greater than about 40 percent and less than about 160 percent of the average diameter. The Kamauchi reference teaches a uniformly blended mixture where no undesirably large, irregular pores are formed in the electrode. These irregular pores cause cracks and defects that decrease the capacity of the electrode. Having a greater range of active material particle sizes will cause a less uniform blended mixture, which is taught to be undesirable by the reference. One of ordinary skill in the art has the knowledge, based on Kamauchi and Manev, to prepare or select particles of preferred sizes by pulverizing or filtering the materials. Further, one of ordinary skill in the art would be motivated to choose specific particles of the average diameter for the electrode, as particles of this diameter are taught to increase the capacity of the electrode (col. 5, lines 30-35.) Pulverizing the particles will provide particles in the nanometer scale range (col. 5, lines 30-36.) It is noted that MPEP 2144.05(b) notes that optimization of ranges within prior art conditions or through routing experimentation is not inventive. The artesian would have found the claimed invention to be obvious in light of the teachings of the references.

Claims 8-9 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goodenough et al. (US 5,910,382), and further in view of Kamauchi et al. (US 5,538,814) and Manev, as applied in the previous section.

Goodenough et al. (US 5,910,382) teaches cathode materials for a lithium secondary battery including $LiFePO_4$ and $LiFe_{1-x}Mn_xPO_4$, where x is between 0 and 1. The anode is lithium

metal or a lithium intercalation material (see col. 1.) The reference is silent to the size of the active material particles. Thus, the reference does not teach that the collection of particles has essentially no particle with a diameter greater than about 3 times or 5 times the average particle size OR that at least 95 percent of the particles have a diameter greater than about 40 percent and less than about 160 percent of the average diameter.

Kamauchi et al. (US 5,538,814) teaches a lithium secondary battery with lithium transition metal oxide complexes, including a lithium cobalt phosphate cathode active material with an average particle size of 10 nm to 20 μm (see col. 5, line 25 to col. 6, line 20 and claims 1-14.) Other metals may be added to the active material including iron and manganese (col. 1, lines 55-end and col. 4, lines 10-65.) The electrode material is pulverized into particles having an average size of 10 nm to 20 μm. Manev (US 5,789,115) teaches cathode materials for a lithium battery. Manev teaches that the mean particle size and the particle size distribution are two of the basic properties characterizing the positive electrode intercalation materials for lithium secondary batteries. The properties are important because they directly influence the charge-discharge rate capacity, the safety cell performance and other features of the battery. A decrease in the mean particle size and the distribution typically results in an increase in the cycleability of these electrode active materials (col. 1, lines 34-50.) Smaller particles are relatively more flexible and cycling does not damage the material to the degree of larger particles. The figures show various particle distributions. It would be obvious to one of ordinary skill in the art at the time the invention was made to prepare the cathode materials of Goodenough et al. (US 5,910,382) with a size of less than 1000 nm, as small sizes provide an

increased surface area and uniform dispersion through the electrode, which increases the capacity of the positive electrode as shown by Kamauchi et al. (US 5,538,814.)

Based on the teachings of Kamauchi and Manev, it would be obvious to one of ordinary skill in the art at the time the invention was made to prepare an electrode of a collection of particles for an electrode material of Kamauchi having a greater number of particles as close in size to the desired average diameter as possible, as the average diameter has been shown to be critical to the invention (see Kamauchi col. 5, lines 25-end; Manev col. 1, lines 34-50.) The Kamauchi reference teaches a uniformly blended mixture where no undesirably large, irregular pores are formed in the electrode. These irregular pores cause cracks and defects that decrease the capacity of the electrode. The reference further teaches that increasing the time of ball milling reduces the size of the active material (examples 10-12.) Having a greater range of active material particle sizes will cause a less uniform blended mixture, which is taught to be undesirable by the reference. One of ordinary skill in the art has the knowledge, based on Kamauchi and Manev, to prepare or select particles of preferred sizes without grinding or by pulverizing or filtering the materials. Further, one of ordinary skill in the art would be motivated to choose specific particles of the average diameter for the electrode, as particles of this diameter are taught to increase the capacity of the electrode (Kamauchi, col. 5, lines 30-35.) Pulverizing the particles will provide particles in the nanometer scale range (Kamauchi, col. 5, lines 30-36.) It is noted that MPEP 2144.05(b) notes that optimization of ranges within prior art conditions or through routing experimentation is not inventive. The artesian would have found the claimed invention to be obvious in light of the teachings of the references.

Claims 54, 58, 59 and 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bodiger et al. (US 5,849,827), in view of Bi et al. (US 5,952,125.)

Bodiger et al. (US 5,849,827) teaches a collection of particles of inorganic powders including aluminum phosphate. Aluminum phosphate is a well-known active material in lithium batteries. The particles have a mean particle diameter of 1-50 nm (see claims 1-9.) The particles are finely divided inorganic powders (claim 9.) The reference teaches a collection of aluminum phosphate particles with a particle size of 0.1-100 nm, preferably 1-50 nm, and in particular 1-30 nm that are extremely finely divided (col. 1, lines 40-50.) The reference is silent to the crystallinity of the material and does not suggest that the material is either crystalline or amorphous. It would be obvious to one of ordinary skill in the art at the time the invention was made to prepare the powder either as a crystalline material or as an amorphous material as the material will provide a significant reduction in burning times in a molding composition regardless of the state of crystallinity. One of ordinary skill in the art would recognize that the crystallinity of the material would not affect the properties of the composition.

The reference does not teach that the collection of particles that has at least 95 percent of the particles have a diameter greater than about 40 percent and less than about 160 percent of the average diameter. Bi et al., however, teaches forming cathode active materials having a high degree of uniformity with a particle distribution where at least 95 percent of the particles have a diameter greater than about 40 percent and less than about 160 percent of the average diameter (col. 8, lines 27-42.) The cathodes are used in lithium batteries with lithium anodes. It would be obvious to one of ordinary skill in the art at the time the invention was made to prepare an aluminum phosphate cathode mixture with at least 95 percent of the particles having a diameter

greater than about 40 percent and less than about 160 percent of the average diameter, as taught in Bi to give improved characteristics such as energy density and capacity (col. 2, lines 12-20.) Further, it would be obvious to one of ordinary skill in the art at the time the invention was made to have essentially no particle with a diameter greater than about 5 times the average particle size since uniformity of greater than about 40 percent and less than about 160 percent of the average diameter. One of ordinary skill in the art would recognize that when a desired average diameter is disclosed in the prior art, choosing particles close to that diameter would be desirable for the function described in the reference. Thus, a collection of particles chosen to have a diameter of at least 95 percent of the particles have a diameter greater than about 40 percent and less than about 160 percent of the average diameter would be desirable as the finely divided inorganic powder in the thermoplastic molding taught by Bodiger et al. These materials will function as the extremely finely divided material in the electrodes taught by Bodiger. MPEP 2144.05(b) notes that optimization of ranges within prior art conditions or through routing experimentation is not inventive. The artesian would have found the claimed invention to be obvious in light of the teachings of the references.

Response to Arguments

Applicant's arguments filed 9/26/2006 have been considered, however they are not persuasive.

The examiner acknowledges and appreciates the kind, professional discussion with applicant's representative, Mr. Dardi, in the interview of 8/31/2006. Applicant's arguments are appreciated and have been fully considered.

Rejections based on 35 U.S.C. 112 2nd paragraph: With regard to the rejection under 35 U.S.C. 112 2nd paragraph, the claims incorporate the phrases, "at least about," "less than about" and "greater than about." The phrases are indefinite as the limitations, "less than and greater than" describe a definite minimum and maximum value, while the word "about" contradicts that value. As shown in the MPEP, section 2173.05(b), the phrase "at least about" is held as indefinite where there is close prior art and nothing in the specification, prosecution history or prior art to provide an indication of what range of specific activity is covered by the term "about," with the MPEP citing Amgen Inc. vs. Chugi Pharmaceutical Co. Ltd. As the average particle sizes in the claims are found in the prior art, the prior art is considered close prior art and the rejection is deemed proper.

Applicant has submitted a list of patents that include the language *at least about*, etc. and concludes that the language is not indefinite. It is well known that the patent office does not comment on allowed patents and this, of course, is a different application than those allowed. It is noted however, that the phrase "at least about" is held as indefinite where there is close prior art and nothing in the specification, prosecution history or prior art to provide an indication of what range of specific activity is covered by the term "about." The facts of each case are different. In this application, the average particle sizes in the claims are found in the prior art, which is considered close prior art. From this, the rejection is deemed proper.

Rejections based on 35 U.S.C. 103(a): With regard to the applicant's arguments to the rejection under 35 U.S.C. 103(a) as being unpatentable over Kamauchi et al. (US 5,538,814) in view of Manev (US 5,789,115), it is noted that Kamauchi et al. (US 5,538,814) teaches a lithium secondary battery with a lithium cobalt phosphate active material with an average particle size of

10 nm to 20 μm (see claims 1-14.) Manev is applied to support the conclusion that uniform particle sizes are desired in battery electrodes for increased performance. The applicant argues that reasonable motivation has not been provided for modifying the invention of Kamauchi to give a collection of particles that has essentially no particle with a diameter greater than about 3 times or 5 times the average particle size OR that at least 95 percent of the particles have a diameter greater than about 40 percent and less than about 160 percent of the average diameter. Applicant argues that Manev teaches away from the claimed invention because Manev teaches that the particles should not necessarily be too small. This is not accurate as the reference teaches the benefits and drawbacks of particle sizes (col. 1) From this, it is clear that the prior art has developed an understanding of particle sizes and how the sizes affect the battery. One of ordinary skill in the art possesses the knowledge of particle sizes and their effects. It is further noted that the particles of Manev include mean particle sizes of 1 μm, which is 1000 nm (*about* 1000 nm is found in claim 1). Five times this amount is 5000 nm or 5 μm. Thus, the particles of Manev are on the order of the compounds found in the instant invention.

Applicant further notes that Manev teaches that grinding the active material is not a desirable method of reducing the mean particle size and particle size distribution of the materials because the battery capacity may be reduced. This teaching states that it is not desirable, however, it does support the Kamauchi reference by teaching that it is possible to grind the material to the desired sizes. Since the claims are not to a battery, the process simply making small particles by grinding is taught to be successful. As the materials are not exactly the same in each reference, grinding may not have the same affect as the materials of the Kamauchi reference. Kamauchi clearly teaches ball milling as a means of reducing the mean particle size

in examples 10-12. The reference gives two specific examples that are less then 1000 nm. Example 12 teaches a size of 10 nm. Example 10 teaches an average particle size of 500 nm (Table 7.) Five times this amount is 2500 nm, or 2.5 micron. It would be obvious to one of ordinary skill in the art to remove particles of this size by filtering as this size based on both Kamauchi and Manev. The Kamauchi reference teaches a uniformly blended mixture such that undesirably large, irregular pores are not formed in the electrode (see col. 5, lines 1-35.) These irregular pores cause cracks and defects that decrease the capacity of the electrode. Having a greater range of active material particle sizes will give a less uniform blended mixture, which is taught to be undesirable by the reference. Further, one of ordinary skill in the art would be motivated to choose specific particles of the average diameter for the electrode, as particles of this diameter are taught to increase the capacity of the electrode (col. 5, lines 30-35.) Pulverizing the particles provide particles in the nanometer scale range (col. 5, lines 30-36, example 10-12.) MPEP 2144.05(b) notes that optimization of ranges within prior art conditions or through routing experimentation is not inventive.

Applicant further cited two articles and summarizes that electrode with uniform submicron particle sizes have improved rate performances in a battery. This is exactly what is taught in Manev (col. 1, lines 40-55) and is the basis of the motivation for using the particles of Kamauchi in this distribution range.

The arguments with respect to the rejection based on Goodenough et al. and Kamauchi et al, are based on the above arguments to the Kamauchi reference and have been addressed in the previous section.

Applicant further argues that the rejection under 35 U.S.C. 103(a) as being unpatentable over Bodiger et al. (US 5,849,827), in view of Bi et al. (US 5,952,125) is deficient because the Bodiger reference fails to teach how to make the phosphates. It is noted that the method of making the material upon which applicant relies is not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Applicant argues that the Bodiger reference only teaches particles sizes and not uniformity of these particles. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

The Bodiger et al. (US 5,849,827) reference clearly teaches a collection of aluminum phosphate particles with a particle size of 0.1-100 nm, preferably 1-50 nm, and in particular 1-30 nm. The materials are extremely finely divided (col. 1, lines 40-50.) Aluminum phosphate is a well-known active material in lithium batteries. The particles have a mean particle diameter of 1-50 nm and are finely divided inorganic powders (claim 9.) The reference does not teach that the collection of particles that has at least 95 percent of the particles have a diameter greater than about 40 percent and less than about 160 percent of the average diameter. Bi et al. teaches forming cathode active materials having a high degree of uniformity with a particle distribution where at least 95 percent of the particles have a diameter greater than about 40 percent and less than about 160 percent of the average diameter (col. 8, lines 27-42.) Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to prepare a mixture

of the aluminum phosphate materials taught in Bodiger with at least 95 percent of the particles having a diameter greater than about 40 percent and less than about 160 percent of the average diameter, as taught in Bi to give improved characteristics such as energy density and capacity (col. 2, lines 12-20.) One of ordinary skill in the art would recognize that when a desired average diameter is disclosed in the prior art, choosing particles close to that diameter would be desirable for the function described in the reference. Thus, a collection of particles chosen to have a diameter of at least 95 percent of the particles have a diameter greater than about 40 percent and less than about 160 percent of the average diameter would be desirable as the finely divided inorganic powder in the thermoplastic molding taught by Bodiger et al.

With regard to claims 55-56, these claims were inadvertently included in this section and the rejection of claims 55-56 under 35 U.S.C. 103(a) as being unpatentable over Bodiger et al. (US 5,849,827), in view of Bi et al. (US 5,952,125) is withdrawn.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a). A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the

advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Examiner Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark Ruthkosky whose telephone number is 571-272-1291. The examiner can normally be reached on FLEX schedule (generally, Monday-Thursday from 9:00-6:30.) If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached at 571-272-1292. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MARK RUTHKOSKY
PRIMARY EXAMINER
12.7.2006

Mark Ruthkosky
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